Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

than the bladder, and are very slender branching filaments (Figs. e, f), somewhat like those figured in Reichenbach for *U. minor*, but with branches more slender and more numerous. The figure and the specimens agree in that the base of the flowering stem sends out two kinds of simple or nearly simple branches, one bearing only leaves, the other, more slender, bearing the bladders. In the fresh specimens these latter branches are seen to be furnished with leaves also, but these are smaller and more distinct than on the other branches. And the bladders, in fact, develop on these more scattered leaves, some of the leaf divisions always remaining distinct. This also is not well shown in Reichenbach's figure.

The hibernacular buds, finally, in this species may occur either on the leafy branches or on those with bladders. There is generally one, rarely more than two, on a plant, so far as appears from the specimens in hand. And they are always on a naked stalk or branch one to two inches long.

In the close observation of the presence, structure and development of the hibernacula in the different North American species of *Utricularia*, there is open an inviting field to some enterprising field botanists favorably located for such a task.

Explanation of Plate CXLI.

Utricularia intermedia.

a. A plant, reduced ½.
b. Leaf, enlarged.
c. Scale from bud, enlarged.
d, e. Bladder-bearing leaves, enlarged.

Notes on Nasturtium Armoracia.

By Charles A. Davis.

Three years ago the attention of the writer was incidentally attracted to this plant, and a series of observations was made on the occurrence on it of pinnatifid leaves, the results of which were published in the Bulletin.

Since that time the plant has been the source of much interest, from various structural peculiarities, of which no previous study has apparently been published. The description of the species, as given in the revised edition of Gray's Manual, is as follows: "Root-leaves very large, oblong, crenate, rarely pinnatifid, those of the stem lanceolate; fruiting pedicels ascending; pods globular (seldom formed); style very short. Roots large and long."

It has been pointed out already that the pinnatifid leaves are not "rarely" but normally present in the spring and fall. In addition, the quoted description should be amended by mention of the fact that the lower stem leaves are invariably pinnately dissected, and gradually pass through pinnatifid and notched forms until near the top they are simply lanceolate with crenate and toothed margins. Of hundreds of flowering stems examined, all had this peculiar arrangement of stem leaves, and extended observation has tended to confirm the opinion that the plant was originally semi-aquatic, which, at the time of flowering, was accustomed to stand knee-deep, as it were, in water. As a further proof of the value of structural peculiarities as indices of the former habits of plants, it may be well to note that very vigorous flowering plants of the species under consideration have been observed growing in ditches and on the margins of ponds, which, though full in the spring and fall, are dry or nearly so in the summer. These plants, at the time the notes were made, stood in water which was of such depth that the dissected leaves were nearly all covered.

By far the most interesting characters of this plant, however, are its provisions for propagation and the preservation of the species. As noted in the description quoted from the Manual, the pods are seldom formed. When formed they are without seeds and soon disappear, apparently falling off, leaving the pedicels fast to the axis of inflorescence. The cause of this failure to mature seed does not appear. The flowers are freely visited by insects, pollen is present in the anthers and seems abundant, and the ovary and ovules are apparently entirely normal. A possible cause of the lack of seeds suggested itself when the stigma was studied. This organ is covered with numerous comparatively long hairs, which may prevent the pollen from reaching the stigmatic surface, or it may be that the pollen, in order to fertilize the ovules, has to fall directly on the tips of these hairs. In either case it would seem highly probable that now and then seeds would mature, but a careful examination of a large amount of material failed to show such mature seeds. It is also possible that the peculiar structure of the stigma makes it impossible for the common insects which visit the plant to produce pollination, and that the peculiar insect developed along with the plant was left behind when it was brought from Europe. To one familiar with the peculiar readiness with which the plant propagates from the root, or even the smallest fraction of it, the absence of seeds capable of germination is not a great surprise, for the plant is well protected against extermination in this way.

The root, so called, has many of the characteristics of a rhizoma and develops buds and leaves from any part that is exposed to the light, or whenever the plant needs an increase of leaf surface. If all parts of the plant except the tips of the roots are destroyed each one of these tips may become one or more plants. If the root be placed on top of the ground it soon becomes green on the upper side at least, and clusters of leaves and rootlets appear. Oftentimes horizontal branches at some distance below the surface will send up vertical branches having small scales at regular intervals in place of leaves, thus forming a vertical rootstock. In one of a series of experiments undertaken to test the possibilities of the plant in this direction, thirteen pieces of the smaller parts of a root were taken, varying from five to nine mm. in diameter and cut into irregular lengths, varying from six mm. to three cm. These were placed in a tightly covered fruit jar, containing a little moisture and left exposed to the light for two weeks or a little longer. At the end of that time twelve of the pieces had green sprouts from one mm. to seven cm. long, measuring the longest leaf, besides numerous rootlets, growing from the points where the buds started out. One piece twenty-five mm. long had eleven well defined buds and sprouts on it, but no rootlets. To one piece a small fibrous branch was attached, and it also bore a vigorous sprout. At the present writing, more than two months after the fragments of root were placed in the jar, the plants which sprung from them are still alive, although the parent roots have rotted. Each of the plantlets has a short thick base, almost like a bulb, which is green in color and shows the scars of leaves which have fallen. In structure and position this part of the plantlet is identical with the tap-root of the plant, as it grows under normal conditions. The readiness of the root to send out buds and grow, is not of much use to the plant in bringing about a rapid and wide distribution of the species, in the undisturbed condition, for the roots do not spread widely, growing as a rule vertically downward, so that a plant and its descendants would be years in spreading a few feet in a lateral direction.

Having no seeds the plant would be handicapped unless some other way of propagation than root-division were developed. The emergency has been met in a manner that is as interesting as rare. Soon after the plant has ceased flowering, and the form of ripening seeds is gone through with, supernumerary buds appear in the axils of the leaves on the upper part of the stem and of those subtending the branches of the inflorescence. These buds grow into very short, acaulescent in fact, branches as the season progresses, and give the old flowering stems the appearance of being diseased. A careful examination of these short branches shows them to be made up of clusters of little leaves, closely resembling seedlings. Each of the older leaves in the cluster has the base of its petiole thickened, and taken together the reserve food supply of one of the branches is considerable. When broken from the parent stem and placed in water these branchlets at once send out roots and are ready to take their chances in life with much greater likelihood of success than the ordinary seedling. A single flowering stem will often develop more than a hundred of these plantlets, all of which are capable of taking root if opportunity offers. Just when or how the plantlets separate from the stem has not been determined, but most likely they fall with the old flowering stem to the ground or into the water, and being set free by the breaking up of the stem, are driven ashore by the wind, where they readily take root. The fact that this provision of the plant for maintaining itself has been developed, leads to some interesting speculations as to the origin of the habit, whether not maturing seeds was the cause or the effect of the other habit, but like many other questions it would seem as if this one would have to go unanswered until our knowledge increases.